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Review of *Androctonus baluchicus* (Pocock, 1900) with description of new species from Iran (Scorpiones: Buthidae)

Обзор *Androctonus baluchicus* (Pocock, 1900) с описанием нового вида из Ирана (Scorpiones: Buthidae)

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КЛЮЧЕВЫЕ СЛОВА: толстохвостый скорпион, *Androctonus sistanus*, новый вид, морфология, Систан и Белуджистан, Иран.

ABSTRACT. The genus *Androctonus* Hemprich et Ehrenberg, 1828 (Scorpiones: Buthidae) is composed of 33 species and distributed in the Middle East and North Africa. Among these taxa, only *Androctonus baluchicus* (Pocock, 1900) and *A. crassicauda* (Olivier, 1807) are reported from Iran. Specimens collected from north of Sistan & Baluchistan Province (southern Iran) from 2016 to 2021 allow to re-assess the taxonomic status of Iranian species. *Androctonus baluchicus* is re-described and *A. sistanus* Barahoei et Mirshamsi, sp.n. described from southeast Iran. *A. baluchicus* is distributed in the Baluchistan region (including northwest Pakistan, southwest Afghanistan), whereas *A. sistanus* Barahoei et Mirshamsi, sp.n. is only known the type locality.

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РЕЗЮМЕ. Род *Androctonus* Hemprich et Ehrenberg, 1828 (Scorpiones: Buthidae) состоит из 33 видов и распространен на ближнем Востоке и в Северной Африке. В Иране отмечены только *Androctonus baluchicus* (Pocock, 1900) и *A. crassicauda* (Olivier, 1807). Экземпляры, собранные на севере провинции Систан и Белуджистан (южный Иран) в 2016–2021 гг. позволяют уточнить таксономический статус иранских видов. Переописан *Androctonus baluchicus* и дано описание *A. sistanus* Barahoei et Mirshamsi, sp.n. из юго-восточного Ирана. *A. baluchicus* распространен в Белуджистане (в т.ч. северо-западный Пакистан, юго-западный Афганистан), тогда как *A. sistanus* Barahoei et Mirshamsi, sp.n. известен только из типового местонахождения.

Introduction

The genus *Androctonus* Hemprich et Ehrenberg, 1828 is part of the family Buthidae family C.L. Koch, 1837 and most of the species are of medical importance [Keegan, 1980]. The name *Androctonus* is actually a direct reference to the potency of the venom. It is a construct from two Greek words that means man killer (Gr. *Andros* = man; *-ctonus* = killer, murderer) (Ehrenberg in Hemprich et Ehrenberg, 1828) and their common name is derived from their distinctly fat metasoma or tail [Hendrixson, 2006].

Vachon [1952] established the genus classification and turned it into a morphologically and geographically homogeneous group with seven known species in the North of Africa. *Androctonus* now consists of 33 species [Rein, 2021] which are distributed in deserts and semi-arid regions on the Atlantic coast of Africa from Togo to Morocco [Lourenço, 2005, 2008; Lourenço, Qi, 2007; Lourenço *et al*., 2009; Teruel, Kovařík, 2014; Rossi, 2015; Sousa *et al*., 2017; Ythier, 2021; Ythier, Lourenço, 2022], in Northern Africa from Algeria to Tunisia [Vachon, 1952; Teruel *et al*., 2013; Teruel, Kovařík, 2014; Ythier, 2021], in Ethiopia [Rossi, 2015],

in Chad Lourenço *et al*., 2012], in Niger [Lourenço, 2015], in the Middle East [Levy, Amitai, 1980; Lourenço, 2005; Hendrixson, 2006; Ozkan *et al*., 2006; Seiter, Turiel, 2013; Al-Azawi, Bassat, 2016; Al-Khazali, Ya□mur, 2019; Ya□mur, 2021], in Afghanistan [Vachon, 1958; Lourenço, 2005; Lourenço, Qi, 2006], in Pakistan [Pocock, 1897, 1900; Lourenço, 2005; Kovařík, Ahmed, 2013; Rossi, 2015; Ahsan *et al*., 2018] and India [Tikader, Bastawade, 1983; Lourenço, 2005; Kovařík, Ahmed, 2013].

Most members of the genus are relatively medium in size (6 to 11 cm) and quite elusive, so it is usually not easy to collect multiple individuals of the same species simultaneously. The main diagnostic characters of *Androctonus* are as follows: Fixed finger of the chelicerae with two ventral teeth; Apex of the movable finger of the pedipalp with 4 terminal denticles (three-terminal and one basal); Trichobothria *eb* located on the fixed finger of the chela; Carapace bear carinae, central, lateral and posterior median carinae not joining together; Metasomal segments heavy and robust, carinae of the tergites not protruding from the posterior lip of the tergites, ventral carinae of metasomal segments without large and distinct teeth; Length of adults above 50 mm [Stahnke, 1972; Lourenço, 2005; Hendrixson, 2006].

The first taxonomic study on *Androctonus* of eastern Iran and the surrounding regions was the description of *Androctonus finitimus* and *Androctonus baluchicus* from Pakistan by Pocock [1897, 1900]. The type specimen of *A. baluchicus* was collected from Baluchistan in northwestern Pakistan and is currently kept in the Natural History Museum in London. It was described as a subspecies, *Buthus australis baluchicus* Pocock, 1900. Subsequently, Lourenço [2005] worked on *Androctonus* specimens deposited in the Geneva Museum and elevated *A. baluchicus* to species level with a short re-description based on three males and one female collected from Lashkar Gah region in the west of Afghanistan. Lourenço & Qi [2006] later described *Androctonus afghanus* from Afghanistan. *Androctonus cholistanus* and *Androctonus robustus* were described from Pakistan by Kovařík & Ahmed [2013] and more recently, *A. finitimus* (Pocock, 1897) was newly recorded from the Punjab Province (Pakistan) by Ahsan *et al*. [2018].

So far, two *Androctonus* species have been reported from Iran, i.e. *Androctonus baluchicus* (Pocock, 1900) and *Androctonus crassicauda* (Olivier, 1807) [Barahoei *et al*., 2020]. *Androctonus baluchicus* was only known from Pakistan and Afghanistan, until Barahoei *et al*. [2020] reported one male and two females from the north Sistan and Baluchistan province extending the known distribution to Iran. *Androctonus robustus* was reported by Yaðmur *et al*. [2016] from the Sistan and Baluchistan, but Barahoei *et al*. [2020] considered these specimens as *A. baluchicus*. *Androctonus crassicauda*, which was first collected from Kashan (Isfahan province, central Iran), now appear to be quite widespread in Iran. It has been reported from all provinces except North Khorasan, Golestan and Mazandaran provinces [Barahoei *et al*., 2020]. Blackish specimens reported as *A. baluchicus* by Moradi *et al*. [2020] from Baluchistan seem be a case of misidentification.

The study of a new series of specimens recently collected from southeastern Iran prompted the re-examination of the Iranian material initially identified as *A. baluchicus* in Barahoei *et al*. [2020]. These specimens appear to be morphologically different from the material from Pakistan and Afghanistan, warranting the description of a new species, *Androctonus sistanus* Barahoei et Mirshamsi, sp.n.

Material and Methods

All specimens were collected from the north of Sistan & Baluchistan province, Iran during 2016–2021 using UV light. The morphological nomenclature follows Stahnke [1970] and Sissom [1990], terminology of pedipalp carinae is based on Prendini [2016], metasomal carinae follows González-Santillán & Prendini [2013], and morphological measurements are based on Sissom *et al*. [1990]. Measurements were taken with an ocular calibrated lens applied to an optical Nikon® SMZ645 stereomicroscope. Photographs were taken using a Canon® EOS 800D or EOS 90D digital camera and edited using Adobe Photoshop®. Abbreviations in the tables: length (L), width (W), anterior width (AW), posterior width (PW), height (H). Samples of the current study were deposited in Insect Collection in Department of Plant Protection, University of Zabol (Iran), Museum d'Histoire Naturelle de Geneve, Geneva (Switzerland) and Zoological Museum, Ferdowsi University of Mashhad, Mashhad (Iran). Abbreviations of specimen repositories are as follows: AZMM — Alaşenir Zoological Museum, Celal Bayar University, Alaşenir, Manisa, Turkey; DPPZ — Department of Plant Protection, University of Zabol, Iran; FKCP — František Kovařík Collection, Praha, Czech Republic; MCVR — Museo Civico di Storia Naturale di Verona, Verona, Italy; MHNG — Museum d'Histoire Naturelle de Geneve, Geneva, Switzerland; MHNL — Musée d'Histoire Naturelle de Lyon, France; MNCN — Museo Nacional de Ciencias Naturales, Madrid, Spain; MNHN — Muséum national d'Histoire naturelle, Paris, France; MZUF — Museo Zoologico "La Specola" dell'Universita di Firenze, Florence, Italy; NHMUK — Natural History Museum, London, United Kingdom; RTOC — Rolando Teruel, private collection, Santiago de Cuba, Cuba; UUZM — Uppsala University Zoological Museum, Uppsala, Sweden; ZMB — Zoological Museum of Berlin, Germany; ZMFUM — Zoological Museum, Ferdowsi University of Mashhad, Mashhad, Iran; ZMH — Zoological Museum of Hamburg, Germany.

Taxonomy

Class Arachnida Lamarck, 1801
Order Scorpiones C.L. Koch, 1837
Superfamily Buthoidea C.L. Koch, 1837
Family Buthidae C.L. Koch, 1837
Genus *Androctonus* Hemprich et Ehrenberg, 1828

DIAGNOSIS: Length of adult sample more than 50 mm; Central, lateral and posterior median carinae of carapace not

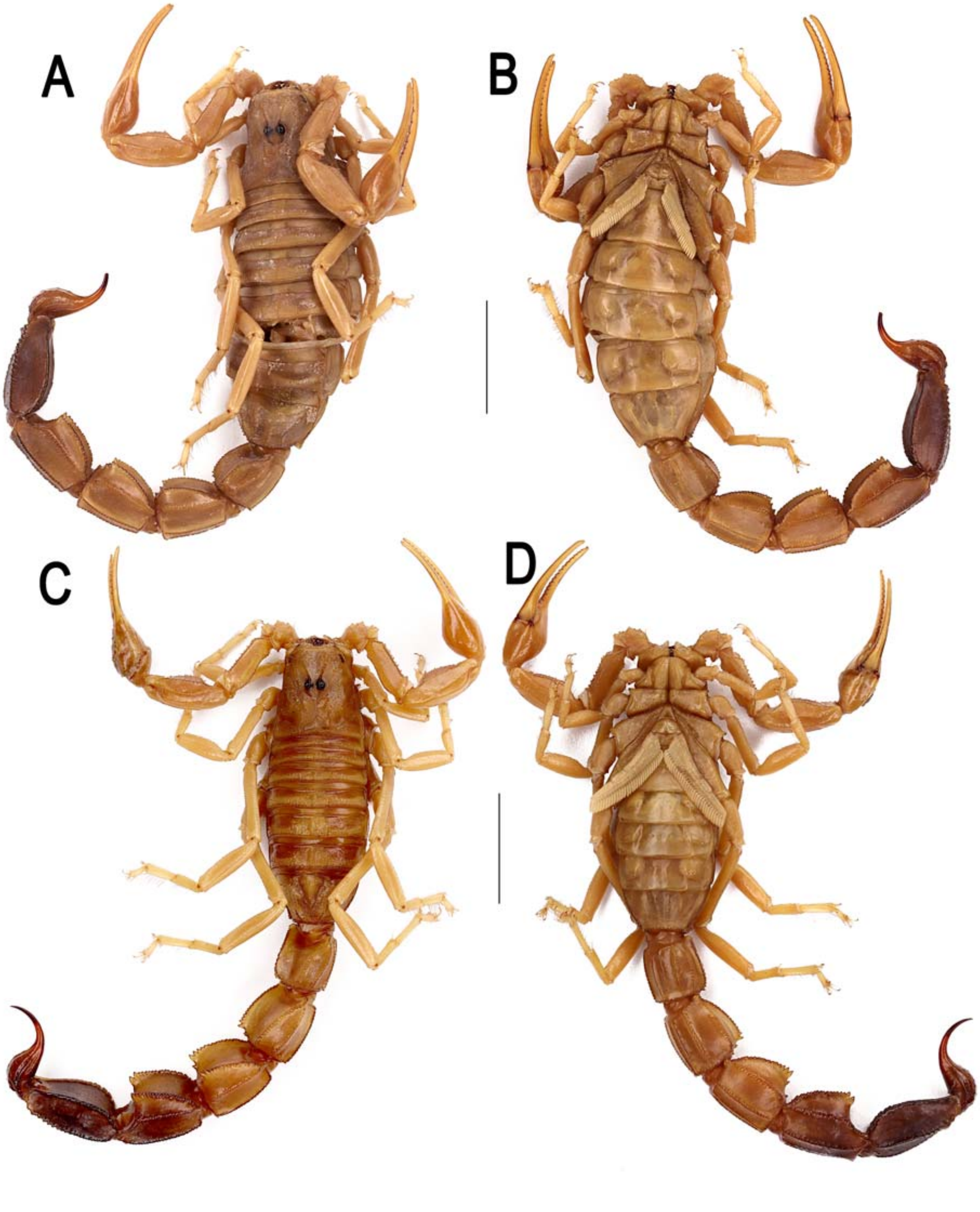


Fig. 1. *Androctonus baluchicus* (Pocock, 1900) (MHNG): A, B — female dorsal and ventral habitus; C, D — male dorsal and ventral habitus. Scale bars: 10 mm.

Рис. 1. *Androctonus baluchicus* (Pocock, 1900) (MHNG): A, B — самка, внешний вид дорсально и вентрально; C, D — самец, внешний вид дорсально и вентрально. Масштаб: 10 мм.

joining; Fixed finger of the chelicerae with two ventral teeth; Apex of the movable finger of the pedipalp with 4 terminal denticles (three terminal and one basal); Trichobothria *eb* located on the fixed finger of the chela; Carinae of tergites not protruding from the posterior margins; Metasomal segments heavy and robust; Ventral carinae of metasomal segments without large and distinct teeth [Stahnke, 1972; Lourenco, 2005; Hendrixson, 2006].

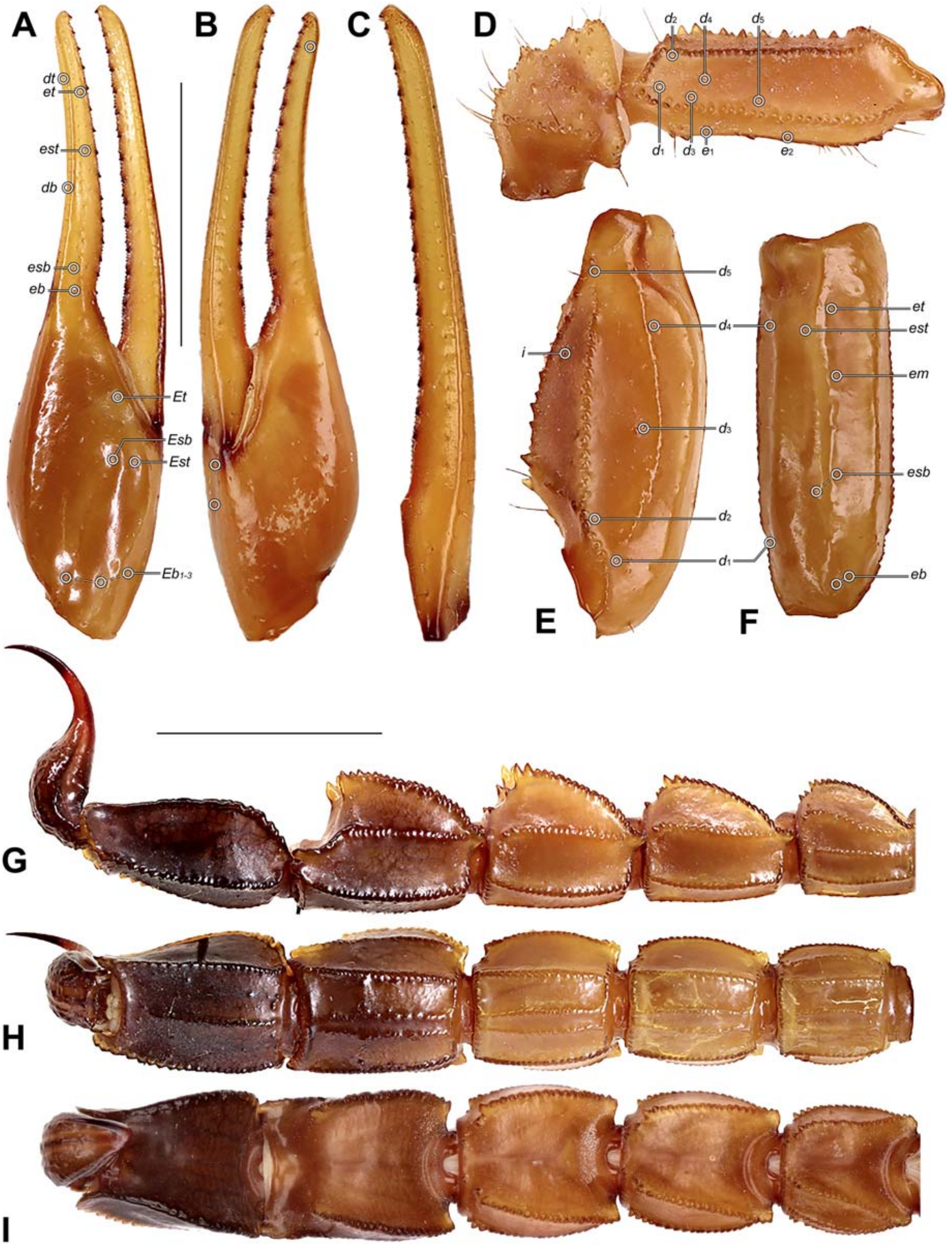


Fig. 2. *Androctonus baluchicus* (Pocock, 1900) (MHNG), male: A — chela, dorsal; B — chela, ventral; C — movable finger of chela, ventral; D — femur, dorsal; E — patella, dorsal; F — patella, retrolateral; G, H, I — metasoma and telson, lateral, ventral and dorsal. Scale bars: A, B, C, D, E, F — 5 mm; G, H, I — 10 mm.

Рис. 2. *Androctonus baluchicus* (Pocock, 1900) (MHNG), самец: A — клешня, дорсально; B — клешня, вентрально; C — подвижный палец клешни, вентрально; D — бедро, дорсально; E — колено, дорсально; F — колено, ретролатерально; G, H, I — метасома и тельсон, латерально, вентрально и дорсально. Масштаб: A, B, C, D, E, F — 5 мм; G, H, I — 10 мм.

Table 1. Morphometric data of *Androctonus baluchicus* (Pocock, 1900).
Таблица 1. Промеры *Androctonus baluchicus* (Pocock, 1900).

Dimensions (mm)		***Androctonus baluchicus* (Pocock)**		
		♀	♂	♂
Carapace	L	7.6	7.5	7.4
	AW	4.2	4	3.9
	PW	8.4	7.9	8
Metasoma + telson	L	40	42	41
Segment I	L	5.6	5.9	5.8
	W	5	5.1	5.1
	H	4.3	4.5	4.3
Segment II	L	6.4	6.5	6.4
	W	5.1	5.6	5.5
	H	4.5	4.8	4.7
Segment III	L	6.6	6.9	6.5
	W	5.3	6.1	6
	H	4.8	5.2	5.2
Segment IV	L	7.2	8.2	7.7
	W	5.2	5.9	5.9
	H	4.5	5	5
Segment V	L	9.2	9.1	8.3
	W	4.9	5.8	5.7
	H	3.8	3.9	3.9
Telson	L	7.8	8.3	8
	W	3.2	2.9	2.9
	H	2.5	2.5	2.3
Femur	L	6.2	6.3	6.1
	W	2	2	1.9
Patella	L	7.4	7.6	7.5
	W	3	2.9	2.9
Chela	L	12.3	12.4	12
Manus	L	4.6	4.7	5
	W	2.9	3.4	3.2
	H	3.2	3.6	3.4
Movable finger	L	9	8.6	8.9
Pedipalp	L	28	26	27
Total	L	**70**	**67**	**65**
Pectinal teeth count		25 | 24	30 | 30	29 | 28

Androctonus baluchicus (Pocock, 1900)
Figs. 1, 2.

Buthus australis baluchicus Pocock, 1900: 6.

Buthus australis balachicus (incorrect spelling): Kraepelin, 1913: 123.

Buthus (*Prionurus*) *crassicauda baluchicus*: Birula, 1917: 93, 240.

Androctonus australis baluchicus: Vachon, 1948: 457; Vachon, 1952: 163.

Androctonus amoreuxi baluchicus: Vachon, 1958: 125–129, figs. 1–7, 9, 50; Levy, Amitai, 1980: 22; Kinzelbach, 1985: map I; Kovařík, 1998: 103.

Androctonus amoreuxi baluchis (incorrect spelling): Pérez, 1974: 18.

Androctonus baluchicus: Lourenço, 2005: 152–154, figs. 12–15.

TYPE LOCALITY AND REPOSITORY. Holotype female, Northern Baluchistan (now Pakistan); NHMUK.

MATERIAL EXAMINED. 1 ♀, 2 ♂♂, 1 ♂ subadult, AFGHANISTAN, Lashkari-Baszar, North of Gala-Bist, October 1971, leg. C. Nauman, MHN-ARTO-23945 (MHNG).

DISTRIBUTION. Afghanistan and Pakistan (Fig. 8) [Fet, Lowe, 2000: 67; Lourenço, 2005: 153].

DIAGNOSIS. Total length 65–70 mm. Base color reddish-yellow to brownish-yellow (Fig. 1; Table 1). Chelicerae yellow, without reticulation. Legs light yellow (Fig. 1). Metasomal segments I–III yellow, segments IV–V and telson black (Figs 1, 2G–I). Carapace densely granulated especially in marginal parts, anterior and posterior median carinae developed, anterior margin straight (Fig. 1A, C). Tarsomeres of legs densely hirsute with bristlecombs. Pedipalp chela with carinae obsolete or absent (Fig. 2A, B). Movable fingers of pedipalps with 14–15 rows of granules with external and internal granules (Fig. 2C). Pectinal teeth number 27–30 in males and 24–25 in female (Fig. 1B, D). Sternites

without carinae; Sternite VII granulated and always with four carinae, lateral carinae incomplete. Metasomal segment I longer than wide, other segments longer than wide (Fig. 2H). Metasomal segment I with 10 carinae, segments II–IV with eight carinae, and segment V with five carinae (Fig. 2G–I). Lateral inframedian carinae on metasomal segments II–III only expressed as one to four large granules on posterior margin (Fig. 2G). Dorsal lateral carinae on metasomal segments I–IV crenelated and terminated by larger spiniform granules, especially segments II–IV (Fig. 2G). Metasomal segment V with five setae on the lateral surface. Anal arch with three lateral serrate lobes (Fig. 2G). Dorsal surface of metasoma smooth.

DESCRIPTION

Size. Body length of adult males 65–67 and adult female 70 mm long (Table 1).

Coloration. Base color reddish-yellow to brownish-yellow. Legs yellow (Fig. 1). Metasomal segments I–III yellowish-brown, metasomal segments IV–V and telson dark brown (Figs 1, 2G–I). Chelicerae yellow without reticulation, finger cutting edges darker, almost black. Pedipalp and mesosoma yellowish-brown, darker than legs (Fig. 1).

Chelicerae. With two basal denticles on the ventral surface of the fixed finger; Movable finger with equally sized external and internal distal denticles.

Carapace. Trapezoid shaped, wider than long, the surface densely granulated. Carinae well-developed. Anterior carapace margin straight, with one to five long macrosetae; Ocular tubercle located on anterior half of prosoma; with five pairs of lateral eyes.

Legs. Tarsomeres of legs densely hirsute, with dense bristlecombs on legs I–III, but absent on leg IV (Fig. 1).

Pedipalps. Segments not significantly elongated. Femur 2.7 (♀) to 3 (♂) times longer than wide (Table 1); Intercarinal surfaces smooth or nearly so, five distinct carinae present; Prodorsal and retrodorsal carinae densely granular; Retroventral carina obsolete, only expressed by few granules, more distinct proximally and distally; Proventral carina densely granular; Promedian carina with scattered large spiniform granules (Fig. 2D). Patella 2.5 times longer than wide (Table 1); Intercarinal surfaces smooth or nearly so, eight carinae present; Promedian and prodorsal carinae with scattered large spiniform granules; Dorsomedian carina densely granulated; Dorso-submedian, retrodrosal, retromedian and retroventral carinae obsolete (smooth ridges); Proventral carina densely granular (Fig. 2E, F). Chela smooth; Carinae obsolete or absent; Manus wider than patella; Fingers about three times longer than manus (Fig. 2A, B; Table 1); Movable finger with 14–15 rows of granules, with external and internal granules, and five distal granules (Fig. 2C); Fixed fingers with 13–14 rows of granules, with external and internal accessory granules (Fig. 2A).

Trichobothriotaxy. Orthobothriotaxic type *A*â, 39 trichobothria per pedipalp (Fig. 2D–F). Femur with 11 trichobothria (five dorsal, four prolateral, two retrolateral). Patella with 13 trichobothria (five dorsal, one prolateral, seven retrolateral), *d2* petite. Chela with 15 trichobothria (eight manus, seven fixed finger); trichobothria *esb*, *Esb*, and *Eb3* petite; *et* adjacent to proximal extremity of denticle subrow 5; *est* adjacent to midpoint of subrow 7.

Mesosoma. Pretergites smooth; Post-tergites smooth proximally, granular posteriorlly; Posttergites I–II without carinae; Post-tergites III–VI with three carinae; Post-tergite VII with five carinae, median carinae only present on anterior half and weakly granulate (Fig. 1A, C). Sternites III–VI without carinae; Sternite VII with four moderately developed carinae, lateral carinae only present on anterior half of segment (Fig. 1B, D). Pectinal tooth count 27–30 (27 (2), 28 (1), 29 (1), 30 (2) [n=6]) in male and 24–25 (24 (1), 25 (1) [n=2]) in female (Table 1); Marginal tips of pectines extending to proximal half of sternite V and beyond coxa-trochanter joint of leg IV in males (Fig. 1D), extending to proximal half of sternite IV and reaching but not extending beyond the coxa-trochanter joint of leg IV in females (Fig. 1B); Pectines with three marginal lamellae and seven middle lamellae; Lamella with numerous setae, fulcrum with two to four. Sternum type I sub-pentagonal and longer than wide with a deep median depression; Genital operculum completely divided longitudinally with fine and short bristles (Fig. 1B, D).

Metasoma. Metasomal segment I longer than wide (Fig. 2H; Table 1), with 10 carinae; Dorso-lateral and lateral-median carinae serrated with larger spiniform granules posteriorly; Lateral inframedian and ventral lateral carinae faintly granulated; Ventral submedian carinae as smooth ridges. Segments II–III with eight carinae; Dorso-lateral and lateral-median carinae serrated with larger spiniform granules posteriorly; Lateral inframedian carinae obsolete only expressed as 2–4 large granules at posterior extremity (Fig. 2G); Ventral lateral carinae faintly granulated; Ventral submedian carinae as smooth ridges. Segment IV with eight carinae; Dorso-lateral and lateral-median carinae serrated with larger spiniform granules posteriorly; Lateral inframedian carinae absent; Ventral lateral carinae faintly granulated; Ventral submedian carinae as smooth ridges. Segment V with five carinae; Dorso-lateral carinae granular anteriorly, a smooth ridge posteriorly; Lateral-median and lateral inframedian carinae absent; Ventral lateral carinae serrated, larger spiniform granules posteriorly; Ventral median carina costate-granular anteriorly, a smooth ridge posteriorly; Five setae on the lateral surface. All segments very sparsely setose. All segments longer than wide (Fig. 2G–I). Anal arch with three lateral serrate lobes (Fig. 2G). Intercarinal surfaces smooth (Fig. 2G–I).

Telson. Elongate in both sexes (Fig. 1), almost asetose, without a subaculear tubercle, ventral surface bumpy (Fig. 2G, H), dorsal surface flat (telson height/length = 0.30 in males and 0.32 in female; telson wide/length = 0.35 in males and 0.41 in female), not wider than metasomal segment V (Fig. 2G, H; Table 1).

Androctonus sistanus Barahoei et Mirshamsi, **sp.n.**
Figs. 3–7.

Androctonus amoreuxi baluchicus: Vachon, 1966c: 209; Habibi, 1971: 42.

Androctonus finitimus: Mir *et al*., 2014: 19.

Androctonus robustus: Ya□mur *et al*., 2016: 1–3, figs 1–2.

Androctonus baluchicus: Barahoei *et al*., 2020: 378, fig. 2.

TYPE MATERIAL. **HOLOTYPE**, 1♀, IRAN, Sistan & Baluchistan Province, Zabol, Hamun, Koush-e Sofla village, 30°51′N, 61°26′E, 482 m a.s.l. (Fig. 3), 3 September 2018, leg. E. Mirshekar (ZMFUM-scr-1549); **PARATYPES**, 1♂, Hamun, Niatak Jungle, 31°07′N, 61°37′E, 1578 m a.s.l., 17 September 2021, leg. M.A. Daryanoush (DPPZ-And-009) (Fig. 7); 1♂, Hamun, Hossein Bagher village, 30°51′N, 61°20′E, 477 m a.s.l., 2 August 2021, leg. H. Barahoei (MHNG).

ADDITIONAL MATERIAL. 1♀, IRAN, Sistan and Baluchistan Province, Niatak Jungle, 31°07′N, 61°37′E, 1582 m a.s.l., 20 April 2016, identified as *Androctonus finitimus* (Pocock, 1897) by Mir *et al*. [2014], re-identified as *A. baluchicus* by Barahoei *et al*. [2020] (ZMFUM); 1♂, Zahedan, Ghargharouk village, 29°57′N,

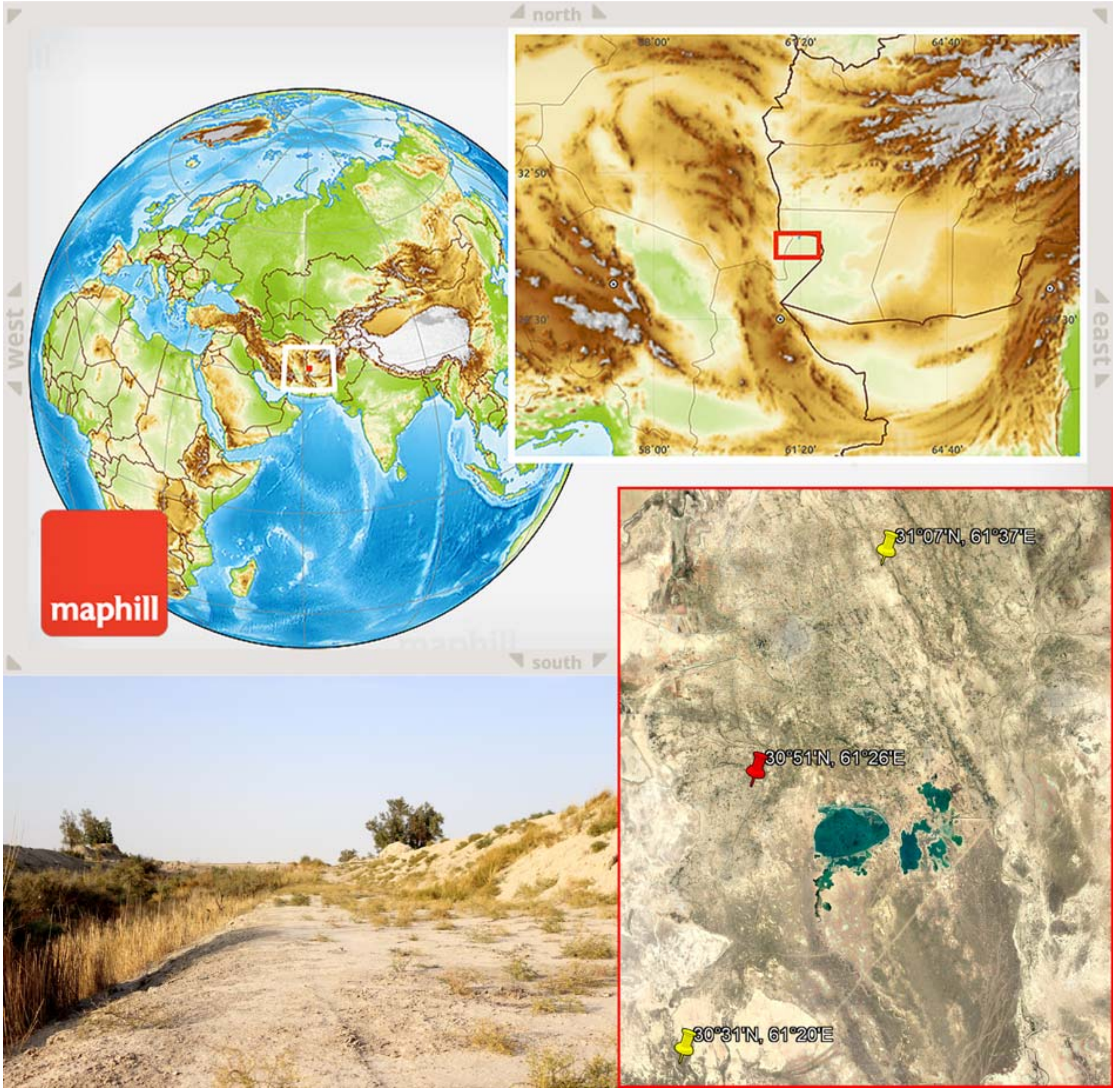


Fig. 3. Habitat map of female holotype *Androctonus sistanus* Barahoei et Mirshamsi, sp.n.

Рис. 3. Место находки голотипа самки *Androctonus sistanus* Barahoei et Mirshamsi, sp.n.

60°53′E, 719 m a.s.l., 2 April 2016, leg. N. Herati, identified as *Androctonus baluchicus* (Pocock, 1900) by Barahoei *et al*. [2020] (DPPZ-And-006) (Fig. 6).

DISTRIBUTION. Endemic to Iran (North of Sistan & Baluchistan province) (Fig. 8).

ETYMOLOGY. The species is named after the type locality of the holotype, Sistan, Iran. Noun in apposition.

DIAGNOSIS. Total length 48.7–66.1 mm. Base color yellow (Figs 4, 6). Chelicerae yellow, without reticulation. Legs light yellow (Figs 4, 6). Metasomal segments I–III yellow, segments IV–V and telson black (Figs 4, 5G–I, 6, 7). Carapace densely granulated especially in marginal parts, anterior and posterior median carinae developed, anterior margin straight (Figs 4A, 6A). Tarsomeres of legs densely hirsute with bristlecombs. Pedipalp chela with carinae obsolete or absent (Fig. 5A–B). Movable fingers of pedipalps have 14–15 rows granules with external and internal granules (Fig. 5C). Pectinal teeth number 27–29 in males (Fig. 6B) and 22–23 in females (Fig. 4B). Sternites III–VI without carinae; Sternite VII granulated and always with four carinae, lateral carinae incomplete (Figs 4B, 6B). Metasomal segment I wider than long, other segments longer than wide (Fig. 5G; Table 2). Metasomal segment I with 10 carinae, segments II–IV with eight carinae, and segment V with five carinae (Fig. 5G–I). Lateral infra median carinae on metasomal segments II–III only expressed as one to four large granules on posterior margin (Fig. 5H). Dorsal lateral carinae on metasomal segments I–IV crenelated and terminated by larger spiniform granules (Fig. 5H). Metasomal segment V with five setae on lateral surface. Anal arch with four lateral serrate lobes (Fig. 5H). Dorsal surface of metasoma smooth (Fig. 5G).



Fig. 4. *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., female (holotype, ZMFUM): A, B — dorsal and ventral habitus. Scale bar: 10 mm.

Рис. 4. *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., самка (голотип, ZMFUM): A, B — внешний вид, дорсально и вентрально. Масштаб: 10 мм.

DESCRIPTION

Size. Body length of adult males 59.4–61.5 and adult females 48.7–66.1 mm long (Table 2).

Coloration. Base color yellow. Legs light yellow (Figs 4, 6, 7). Metasomal segments I–III yellow, metasomal segments IV–V and telson black, other metasomal segments yellow (Figs 4, 5G–I, 6, 7). Chelicerae yellow without reticulation, finger cutting edges darker, almost black. Pedipalp and mesosoma yellow, darker than legs (Figs 4, 6, 7). Prolateral part of femur and patella black (Figs 4A, 5D–E, 6A, 7).

Chelicerae. As described in *A. baluchicus*.

Carapace. As described in *A. baluchicus*. Anterior carapace margin straight, with seven to nine long macrosetae.

Legs. Tarsomeres of legs densely hirsute, with dense bristlecombs on legs I–IV (Fig. 6).

Pedipalps. Segments not significantly elongated. Femur 2.7 (♀) to 3 (♂) times longer than wide (Table 2); Intercarinal surfaces smooth or nearly so; five distinct carinae; Prodorsal and retrodorsal carinae densely granular; Retroventral carina obsolete, only expressed by few granules, more distinct proximally and distally; Proventral carina densely granular; promedian carina with scattered large spiniform granules (Fig. 5D). Patella 2.5 times longer than wide (Table 2); intercarinal surfaces smooth or nearly so; with eight carinae; Promedian and prodorsal carinae with scattered large spiniform granules; Dorsomedian carina densely gran-

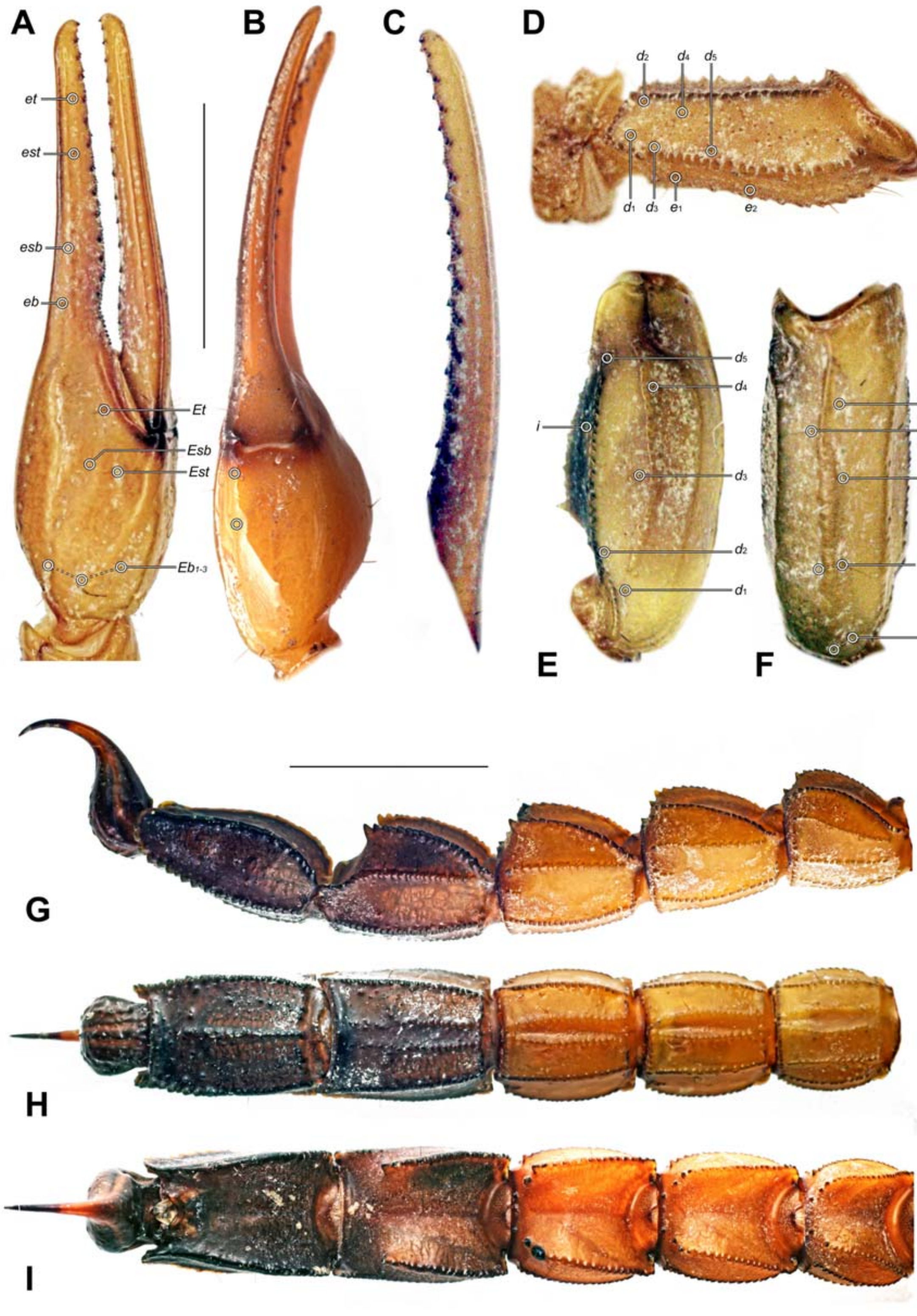


Fig. 5. *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., female (holotype, ZMFUM): A — chela, dorsal; B — chela, ventral; C — movable finger of chela, ventral; D — femur, dorsal; E — patella, dorsal; F — patella, retrolateral; G, H, I — metasoma and telson, lateral, ventral and dorsal. Scale bars: A, B, C, D, E, F — 5 mm; G, H, I — 10 mm.

Рис. 5. *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., самка (голотип, ZMFUM): A — клешня, дорсально; B — клешня, вентрально; C — подвижный палец клешни, вентрально; D — бедро, дорсально; E — колено, досально; F — колено, ретролатерально; G, H, I — метасома и тельсон, латерально, вентрально и дорсально. Масштаб: A, B, C, D, E, F — 5 мм; G, H, I — 10 мм.

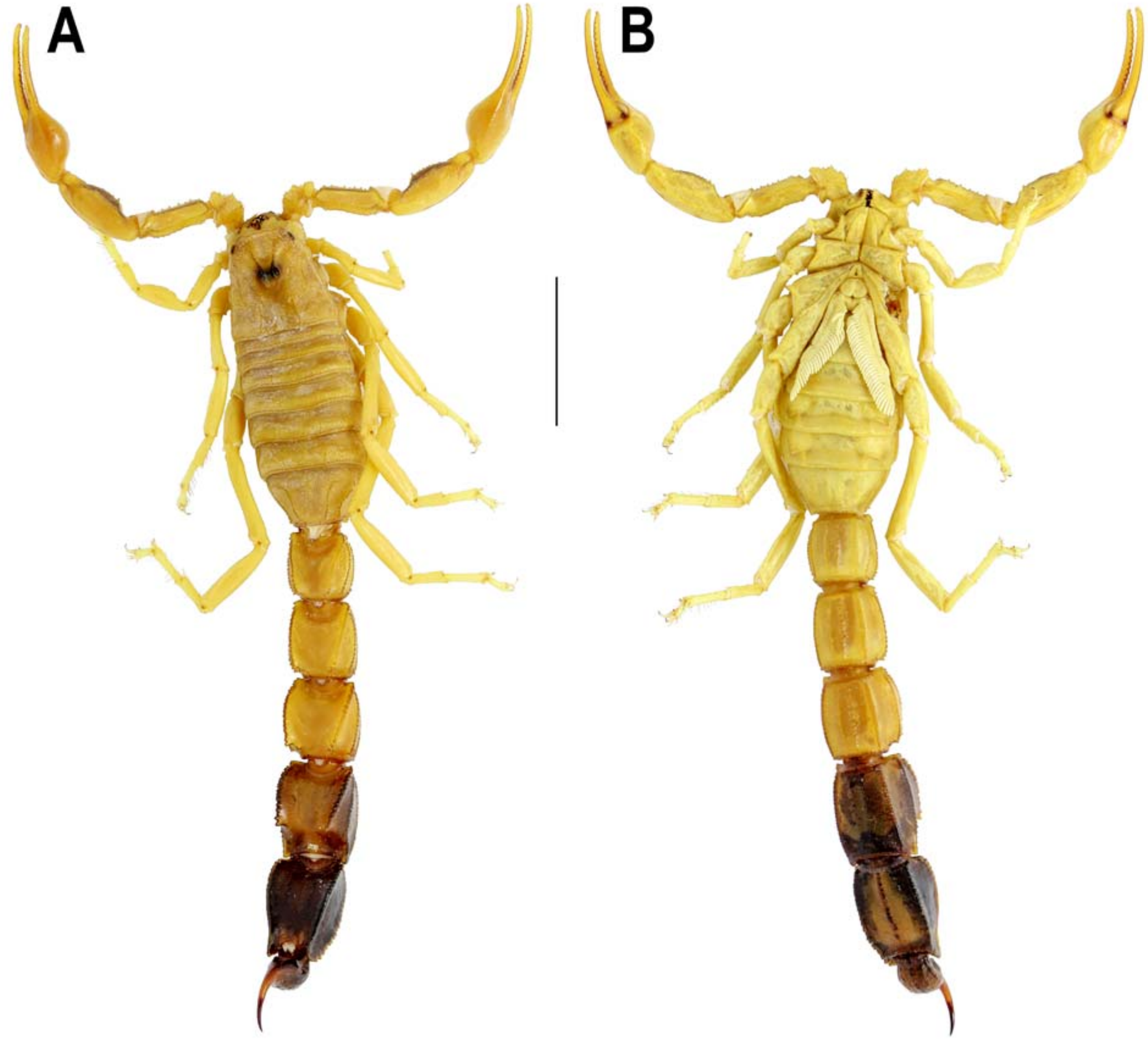


Fig. 6. *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., male (paratype, ZMFUM): A, B — dorsal and ventral habitus. Scale bar: 10 mm.

Рис. 6. *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., самец (паратип, ZMFUM): A, B — внешний вид, дорсально и вентрально. Масштаб: 10 мм.

ulated; Dorso-submedian, retrodrosal, retromedian and retroventral carinae obsolete (smooth ridges); Proventral carina densely granular (Fig. 5E–F). Chela smooth, carinae obsolete or absent; Manus wider than patella; Fingers about three times longer than manus (Fig. 5A–B; Table 2); Movable finger with 14–15 rows of granules, with external and internal granules, and five distal granules (Fig. 5C); Fixed fingers with 14–15 rows of granules, with external and internal accessory granules (Fig. 5A).

Trichobothriotaxy. As described in *A. baluchicus* (Fig. 5D–F).

Mesosoma. Pretergites smooth; Post-tergites granular; post-tergites I–VI with three carinae; Post-tergite VII with five carinae, median carinae only present on anterior half and weakly granulate (Figs 4A, 6A). Sternites III–VI without carinae; Sternite VII with four moderately developed carinae, lateral carinae only present on anterior half of segment (Figs 4B, 6B). Pectinal tooth count 27–29 (27 (2), 28 (1), 29 (1) [n=4]) in males (Fig. 6B), and 21–23 (21 (1), 22 (2), 23 (1) [n=4]) in females (Fig. 4B); Marginal tips of pectines extending to proximal half of sternite V and beyond coxa-trochanter joint of leg IV in males (Fig. 6B), extending to proximal half of sternite IV and reaching but not extending beyond the coxa-trochanter joint of leg IV in females (Fig. 4B); Pectines with three marginal lamellae and seven middle lamellae; Lamella with numerous dark setae, fulcrum with one to four. Sternum type I sub-pentagonal and longer than wide with a deep median depression; Genital operculum completely divided longitudinally with fine and short bristles (Figs 4B, 6B).

Metasoma. Metasomal segment I wider than long (Fig. 5G; Table 2), with 10 carinae (Fig. 5G–I); Dorso-lateral and lateral-median carinae serrated with larger spiniform granules posteriorly; Lateral inframedian and ventral lateral cari-



Fig. 7. Live specimen of *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., dorsal habitus, male (paratype, DPPZ-And-009).

Рис. 7. Живой экземпляр *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., внешний вид, дорсально, самец (паратип, DPPZ-And-009).

nae faintly granulated; Ventral submedian carinae as smooth ridges. Segments II–III with eight carinae; Dorso-lateral and lateral-median carinae serrated with larger spiniform granules posteriorly; Lateral inframedian carinae obsolete only expressed as 1–4 large granules at posterior extremity (Fig. 5G); Ventral lateral carinae faintly granulated; Ventral submedian carinae as smooth ridges. Segment IV with eight carinae; Dorso-lateral and lateral-median carinae serrated with larger spiniform granules posteriorly; Lateral inframedian carinae absent; ventral lateral carinae faintly granulated; Ventral submedian carinae as smooth ridges (Fig. 5G–I). Segment V with five carinae; Dorso-lateral carinae granular anteriorly, a smooth ridge posteriorly; Lateral-median and lateral inframedian carinae absent; Ventral lateral carinae serrated, larger spiniform granules posteriorly; Ventral median carina costate-granular anteriorly, a smooth ridge posteriorly; Five setae on lateral surface (Fig. 5G–I). All segments very sparsely setose. Segment I wider than long, and other segments longer than wide (Fig. 5G–I; Table 2). Anal arch with four lateral serrate lobes (Fig. 5G). Ventral intercarinal surfaces of segments IV–V finely and sparsely granular (Fig. 5H).

Telson. As described in *A. baluchicus*. Telson height/length = 0.30 in males and 0.33 in females; telson wide/length = 0.37 in males and 0.43 in females (Table 2).

AFFINITIES. *Androctonus sistanus* sp.n. is closely related to *A. baluchicus*, *A. finitimus* (Kovařík et Ahmed, 2013)and *A. robustus* (Kovařík et Ahmed, 2013). The prolateral intercarinal surfaces of patella and femur are the same color as the rest of the segments in *A. baluchicus* (Fig. 2D–E), whereas they are dark in *A. sistanus* Barahoei et Mirshamsi, sp.n. (Figs 5D–E, 7). In *A. finitimus* and *A. robustus* metasomal segment IV is never entirely black, the darker pigment may spread on the sides and posterior surface [Lourenço, 2005; Kovařík, Ahmed, 2013], whereas it is entirely dark in *A. sistanus* sp.n. and *A. baluchicus* (Figs 2G–H, 5G–I). Pectinal teeth number is 24–25 in females of *A. baluchicus* but is 22–23 in females of *A. sistanus* sp.n. On the pedipalp femur, the trichobothria *d4* is close to the prodorsal carina, away from *d3* in *A. sistanus* sp.n. (Fig. 5D), whereas *d3* and *d4* are close by in *A. baluchicus* (Fig. 2D). On the pedipalp chela finger, the trichobothria *esb* of the chela finger is apart from *eb* in *A. sistanus* sp.n. (Fig. 5A), whereas *esb* and *eb* are close by in *A. baluchicus* (Fig. 5D). The metasomal segment III of male is higher than long or as high as long in *A. robustus*, whereas it is longer than high in *A. sistanus* sp.n. (Fig. 5G; Table 2), *A. finitimus* and *A. baluchicus* (Fig. 2G). Metasomal segment I is longer than wide in *A. baluchicus* (Fig. 2H; Table 1) but is wider than long in *A. sistanus* sp.n. (Fig. 5H; Table 2). (Fig. 5G). Ventral intercarinal surfaces of metasomal segments IV–V are smooth in *A. baluchicus* (Fig. 2H), whereas they are finely and sparsely granulated in *A. sistanus*

Table 2. Morphometric data of *Androctonus sistanus* Barahoei et Mirshamsi, sp.n.
Таблица 2. Промеры *Androctonus sistanus* Barahoei et Mirshamsi, sp.n.

Dimensions (mm)		*Androctonus sistanus* sp.n.			
		♀ holotype (ZMFUM)	♀ paratype (ZMFUM)	♂ paratype (MHNG)	♂ paratype (DPPZ)
Carapace	L	8.5	7.2	7.5	7.4
	AW	5.5	4	5.2	5
	PW	8.6	7.3	7.6	7.5
Metasoma + telson	L	43	31	39.6	38.2
Segment I	L	5.3	3.8	5	4.7
	W	5.5	4	5.1	4.8
	H	5	3.6	4.5	4.4
Segment II	L	6.3	4.5	5.7	5.6
	W	5.9	4.2	5.3	5.3
	H	5.3	3.9	5	4.8
Segment III	L	6.3	4.7	6	5.8
	W	6	4.4	5.8	5.6
	H	5.6	4	5.5	5.3
Segment IV	L	7.5	5.5	7.1	7
	W	5.9	4.2	5.7	5.6
	H	5.6	4	5.2	5
Segment V	L	8.8	6.3	8	7.6
	W	5.5	3.8	5.5	5.4
	H	4.6	3	3.2	3.1
Telson	L	8.8	6	7.8	7.5
	W	3.8	2.6	2.9	2.8
	H	2.9	2	2.4	2.3
Femur	L	6.3	4.6	5.7	5.5
	W	2.3	1.7	1.9	1.8
Patella	L	7.4	5.7	6.8	6.7
	W	2.9	2.2	2.7	2.6
Chela	L	13.5	10.6	12.7	12.4
Manus	L	4.5	3.5	4.3	4.2
	W	3.8	2.5	3.5	3.5
	H	3.1	2.2	3	3
Movable finger	L	9	6.8	8.4	8.2
Pedipalp	L	27.2	20.9	25.1	24.6
Total	L	**66.1**	**48.7**	**61.5**	**59.4**
Pectinal teeth count		21 | 22	22 | 23	27 | 27	28 | 29

sp.n. (Fig. 5H). The anal arch has three lateral lobes in *A. baluchicus* (Fig. 2G), whereas it has four lateral lobes in *A. sistanus* sp n.

Androctonus species occupy distinct non-overlapping geographic regions (Fig. 8). *A. finitimus* and *A. robustus* are distributed in the Sindh region (Southeast Pakistan), *A. baluchicus* in the Baluchistan region (northwest Pakistan, southwest Afghanistan), and *A. sistanus* sp.n. in southeast Iran [Pocock, 1900; Lourenço, 2005; Kovařík, Ahmed, 2013; Barahoei *et al*., 2020].

Discussion

The purpose of this study was to clarify the situation of *A. baluchicus* in Iran, which resulted in the description of a new species. When Pocock [1900] described the species for the first time, he did not designate a holotype or type series [Fet, Lowe, 2000]. It is confirmed that there are no types of *A. baluchicus* in the collections of the British Museum, London (Janet Beccaloni, pers. comm.). Nonetheless, Lourenço [2005] elevated *A. baluchicus* to species level. In order to designate a neotype, we made great efforts to recollect specimens at the type locality, but failed. This suggested that *A. baluchicus* has a restricted distribution.

All specimens of *A. baluchicus*, *A. finitimus* and *A. robustus* previously reported for Iran are considered here to be misidentified [Mir *et al*., 2014; Yaðmur *et*

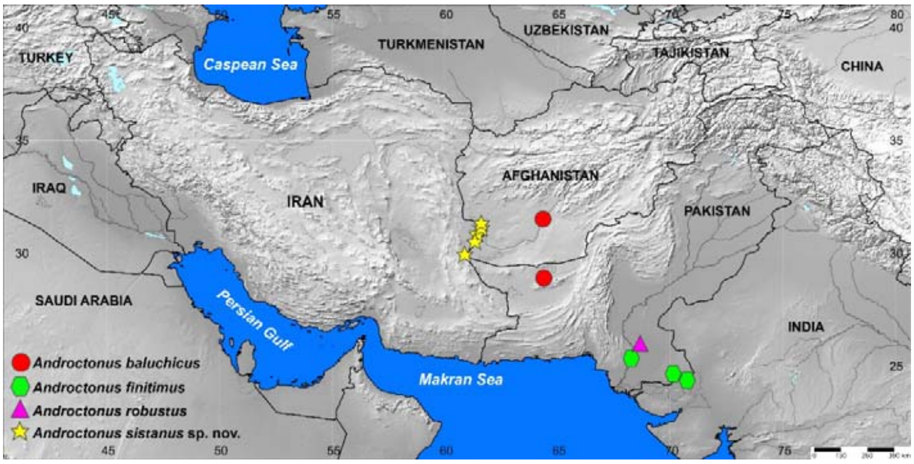


Fig. 8. Distribution map of *Androctonus sistanus* Barahoei et Mirshamsi, sp.n. along with the most similar species to new species on the world background.

Fig. 8. Карта распространения *Androctonus sistanus* Barahoei et Mirshamsi, sp.n., вместо с ближайшими к нему видами.

al., 2016; Barahoei *et al*., 2020]. These specimens show ecological and morphological characters distinct from other non-Iranian *Androctonus* species, thus suggesting that they constitute a distinct taxon [Barahoei, Mirshamsi, 2021]. *A. sistanus* sp.n. is thus described here to accommodate these specimens. Although we did not have access to Ya□mur's *et al*. [2016] material, the pictures and description of the original publication are sufficient to confirm that it also belongs to *A. sistanus*. Consequently, *A. baluchicus* was removed from the Iranian scorpion checklist and the relevant information in the Barahoei's *et al*. [2020] was updated. With the description of *A. sistanus*, the species number for *Androctonus* is now 34 (Table 3).

Moradi *et al*. [2020] reported the occurrence of dark specimens of *A. baluchicus*. Dark specimens of *Androctonus* have been collected in eastern Iran? [Barahoei, Mirshamsi, 2021], but further morphological and molecular studies are needed to confirm whether they belong to an undescribed species.

Androctonus crassicauda (Olivier, 1807), a widespread species in Iran (Fig. 5 in Barahoei *et al*. [2020]), is the second most dangerous and deadly scorpion to human in the country behind *Hemiscorpius lepturus* Peters, 1861 [Mohammadi-Bavani *et al*., 2017]. On the other hand, *Androctonus sistanus* sp.n. is distributed only in the southeast of the country and although there is thus far no information about the potency of its venom, it is better to consider it as potentially dangerous to human like its congener.

In Iran where scorpionism is a major problem, accurate knowledge of regional scorpion fauna and of precise distribution ranges for medically important species is of paramount importance. The quality of envenomation treatment management is directly dependent on precise identification of specimens responsible for stings. A better knowledge of the scorpion fauna will lead to more accurate determination and thus to better care of stung patients.

Conflict of Interests

The authors declare no potential conflict of interest.

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Table 3. Known species of genus *Androctonus* Hemprich et Ehrenberg, 1828.
Таблица 3. Список известных видов рода *Androctonus* Hemprich et Ehrenberg, 1828.

Species	**Type repository**	**Distribution**	**Reference/s**
Androctonus aeneas C.L. Koch, 1839	MNHN	Algeria, Tunisia	Ythier, 2021
Androctonus afghanus Lourenço et Qi, 2006	MNHN	Afghanistan	Lourenço, Qi, 2006
Androctonus aleksandrplotkini Lourenço et Qi, 2007	MNHN	Mauritania	Lourenço, Qi, 2007
Androctonus agrab Ythier et Lourenço, 2022	MNHN	Western Sahara	Ythier, Lourenço, 2022
Androctonus amoreuxi (Audouin, 1826)	MNHN	Algeria, Libya, Egypt, Mauritania, Morocco, Israel?	Ythier, 2021
Androctonus australis (Linnaeus, 1758)	UUZM	Algeria, Egypt, Libya, Tunisia	Ythier, 2021
Androctonus baluchicus (Pocock, 1900)	NHMUK	Afghanistan, Pakistan	Lourenço, 2005
Androctonus barbouri (Werner, 1932)	MNCN	Morocco	Sousa *et al*., 2017
Androctonus bicolor Ehrenberg, 1828	ZMB	Egypt, Israel	Teruel, Kovařík, 2014
Androctonus bourdoni Vachon, 1948	MNHN	Morocco	Ythier, Lourenço, 2022
Androctonus burkinensis Ythier, 2021	MHNL	Burkina Faso	Ythier, 2021
Androctonus cholistanus Kovařík et Ahmed, 2013	FKCP	India, Pakistan	Kovařík, Ahmed, 2013
Androctonus crassicauda (Olivier, 1807)	MNHN	Armenia, Azerbaijan, Bahrain, Egypt, Iraq, Iran, Israel, Jordan, Kuwait, Libya, Oman, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen	Ythier, 2021
Androctonus dekeyseri Lourenço, 2005	MNHN	Mauritania, Senegal	Lourenço, 2005
Androctonus donairei Rossi, 2015	MZUF	Morocco	Rossi, 2015
Androctonus eburneus (Pallary, 1928)	MNHN	Togo	Lourenço, 2008
Androctonus finitimus (Pocock, 1897)	NHMUK	Pakistan	Lourenço, 2005; Kovařík, Ahmed, 2013
Androctonus gonneti Vachon, 1948	MNHN	Mauritania, Morocco	Ythier, 2021
Androctonus hoggarensis (Pallary, 1929)	MNHN	Algeria	Ythier, 2021
Androctonus liouvillei (Pallary, 1924)	MNHN	Algeria, Morocco	Teruel, Kovařík, 2014
Androctonus maelfaiti Lourenço, 2005	MNHN	India	Lourenço, 2005
Androctonus mauritanicus (Pocock, 1902)	NHMUK	Mauritania, Morocco	Lourenço, 2005

Table 3 (continued).
Таблица 3 (продолжение).

Species	Type repository	Distribution	Reference/s
Androctonus pallidus Lourenço et al., 2012	MNHN	Chad	Lourenco *et al*., 2012
Androctonus robustus Kovařík et Ahmed, 2013	FKCP	Pakistan	Kovařík, Ahmed, 2013
Androctonus santi Lourenço, 2015	MNHN	Niger	Lourenço, 2015
Androctonus sergenti Vachon, 1948	MNHN	Morocco	Lourenço, 2005
Androctonus simonettai Rossi, 2015	MZUF	Ethiopia	Rossi, 2015
Androctonus sistanus Barahoei et Mirshamsi, sp.n.	ZMFUM MHNG	Iran	This study
Androctonus tenuissimus Teruel et al., 2013	RTOC	Egypt	Teruel *et al*., 2013
Androctonus tigrai Lourenço et al., 2015	MCVR	Ethiopia	Teruel *et al*., 2015
Androctonus togolensis Lourenço, 2008	ZMH	Togo	Lourenço, 2008
Androctonus tropeai Rossi, 2015	MZUF	Pakistan	Rossi, 2015
Androctonus turkiyensis Yagmur, 2021	AZMM	Turkey	Yagmur, 2021

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